

**REMARKS**

This paper is responsive to an Office Action dated November 6, 2003. Prior to this amendment claims 1-8 and 20-23 were pending. Claims 9-19 were previously withdrawn, without traverse, in response to an election requirement. After amending claims 1, 5, and 20-22, claims 1-8 and 20-23 remain pending.

The Office Action states that claims 1-8 and 20-23 have been rejected under 35 U.S.C. 112, second paragraph, as being indefinite. In response, claims 1, 5, and 20-22 have been amended to remove the word "thin".

The Office Action states that claim 1 has been rejected under 35 U.S.C. 102(a) as being anticipated by Bergman (US 6,497,768). The Office Action states that Bergman describes a process of forming a sheet of water over a substrate (with organic contaminants), and blowing ozone gas into the sheet of water. This rejection is traversed as follows.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

Bergman describes a cleaning process that seeks to avoid forming too thick of a water layer, as the water film acts a diffusion barrier to ozone (col. 8, ln. 61-67). To solve this water thickness problem Bergman suggests 2 solutions. They are: rotating the substrate to be cleaned; and, controlling the water flow rate (col. 9, ln. 33-45). However, Bergman does not describe a process of "blowing ozone gas into a sheet of

water" as the claimed invention does. Instead, Bergman describes two alternate ozone-introduction techniques, stating that "ozone is injected into the fluid flow path 60 during the water spray, or otherwise provided to the internal chamber environment of chamber 15" (col. 9, ln. 46-48; also see Step 215 of Fig. 3).

With respect to "ozone injection" process, Bergman states that a "pump mechanism 55 provides the liquid under pressure along a fluid flow path, shown generally at 60, for ultimate supply to the input of the nozzles 40" (emphasis added) (col. 7, ln. 28-31). Bergman states that "nozzles 40 are disposed within the treatment chamber 15 to direct a spray mixture of ozone and treatment liquid onto the surfaces of the semiconductor workpieces 20..." (col. 7, ln. 12-14). Clearly, Bergman injects ozone into the water before the nozzle input, before water is applied to the substrate.

With respect to the "otherwise provided" ozone delivery process, Bergman merely introduces ozone into the chamber. An ozone vapor generator is described at col. 4, ln. 31-39. Bergman also states that, "nozzles 40...spray the liquid on the surface of the semiconductor workpieces 20 that are to be treated and, further, introduce ozone into the environment of the treatment chamber 15 (col. 7, ln. 45-48). Referencing flow path 60, Bergman states that "the injection of ozone continues after the spray has shut off" (col. 9, ln. 49-50). That is, the nozzles may be used to generally introduce ozone into to chamber if there is no water flow.

Neither of Bergman's ozone-introduction techniques describe a process of blowing ozone into a sheet of water formed on the substrate surface. Alternately stated, the invention of claim 1 blows ozone after a water sheet is formed on the substrate to be cleaned. Bergman either

adds ozone to water before it is sprayed on the substrate, or generally introduces ozone into the chamber. Since Bergman does not describe all the elements of claim 1, he cannot anticipate. The Applicant respectfully requests that the rejection be removed.

The Office Action states that claims 1-5, 8, and 21-23 have been rejected under 35 U.S.C. 103(a) as unpatentable with respect to Bergman. With respect to claim 2, the Office Action states that it would have been within ordinary skill to form a via. With respect to claim 3 the Office Action acknowledges that Bergman does not describe a resin thickness, but states that it would have been within the skill of one in the art to optimize a variable (the thickness). With respect to claim 4, the Office Action states that a concentration would have been obvious to determine. With respect to claim 5, the water temperature ranges overlap. With respect to claim 8, Bergman teaches a higher ashing rate, but that other rates would be obvious. With respect to claim 21, Bergman describes the supply of water from underneath. With respect to claims 22-23, Bergman describes rates of rotation. This rejection is traversed as follows.

An invention is unpatentable if the differences between it and the prior art would have been obvious at the time of the invention. As stated in MPEP § 2143, there are three requirements to establish a *prima facie* case of obviousness.

First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

The teaching or suggestion to make the claimed combination and reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure. *In re Vaeck* 947 F.2d 488, 20 USPQ2d, 1488 (Fed. Cir. 1991).

In accordance with the above-stated first *prima facie* requirement, the reference itself must suggest a reason to modify a reference, or the knowledge generally available must provide a motivation to modify the reference in such a way as to make the claimed invention obvious. As noted above in response to the anticipation rejection, Bergman describes a process that either mixes ozone with water, before the ozone/water mixture is sprayed on the substrate to be cleaned, or generally introduces ozone into the chamber. Bergman does not suggest the use of alternate processes for mixing ozone and water. Thus, there is no suggestion that the Bergman reference be modified in such a way as to make obvious the invention of claim 1. For example, Bergman never suggests that his nozzles 40 be modified for the purpose of blowing ozone into a water sheet formed on his semiconductor workpieces 20. Bergman's concern is with using the nozzles to establish a thin layer of water on the workpieces.

Further, the Office Action has not demonstrated that the modification of the cited the prior art reference points to the reasonable expectation of success in the present invention, which is the second requirement of the obviousness analysis. That is, Bergman does not point to a process that adds ozone to water, after a water sheet is formed on the substrate surface to be cleaned.

The third requirement to support a *prima facie* case of obviousness requires that the reference disclose all the elements of the

claimed invention. As noted above in response to the anticipation rejection, Bergman does not teach the process of blowing ozone gas into a sheet of water that overlies the surface to be cleaned. Rather, Bergman teaches a process of either adding the ozone to water before it is sprayed on the surface to be cleaned, or generally introducing ozone into the chamber.

Bergman neither suggests, nor recites all the elements of claim 1. Claims 2-5, 8, and 21-33, dependent upon claim 1, enjoy the same distinctions from the cited reference, and the Examiner is requested to withdraw the rejection.

The Office Action has rejected claims 1-8 and 20-23 as unpatentable under 35 U.S.C. 103(a) with respect to Bergman in view of the admitted prior art (APA). The Office Action acknowledges that the APA fails to teach a process to clean vias, but that Bergman describes a moist ozone gas process useful after a via etching process. The Office Action further states that it would have been obvious to one skilled in the art to combine the two references. This rejection is traversed as follows.

The APA discusses an O<sub>2</sub> dry etch process to remove resin residue after a conventional photoresist etching operation (page 2, ln. 1-14). The APA also describes a CF<sub>4</sub> + O<sub>2</sub> plasma etching process. Neither of the references describes a combination of a plasma/dry etch process with a water/ozone process. Alternately stated, the APA does not suggest a means for modifying a plasma/dry etch process for use with a water/ozone etching process. Neither does Bergman suggest a means for adding a water/ozone etching process to a plasma/dry etch process. These are processes that must be conducted in different types of treatment chambers, at separate times. Even if there was a suggest to combine the

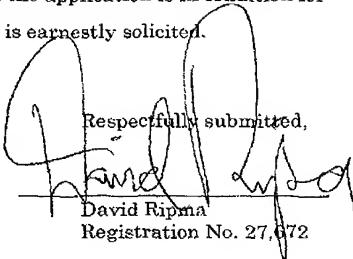
APA and Bergman processes, the combination still does not suggest the step of blowing ozone gas into a sheet of water overlying the substrate to be cleaned.

Neither has the Office Action demonstrated that the modification of the combined prior art reference points to the reasonable expectation of success in the present invention, which is the second requirement of the obviousness analysis.

The third requirement to support a *prima facie* case of obviousness requires that the combined references disclose all the elements of the claimed invention. The two cited references, even when combined, do not teach the claimed invention's step of blowing ozone gas into a sheet of water that is formed on the surface to be cleaned. The combination of references neither suggests, nor recites all the elements of claims 1 and 20. Claims 2-8 and 21-23, dependent upon claim 1, enjoy the same distinctions from the cited reference, and the Applicant requests that the rejection be withdrawn.

It is believed that the application is in condition for  
allowance and reconsideration is earnestly solicited.

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